REMARKS

Status of Claims:

Claims 10-23 and 29-31 were in the application. Claims 23 and 31 are hereby canceled. Claims 10-22 and 29-30 are pending. Each claim defines an invention that is novel and unobious over the art. Claims 10, 22, and 30 have been amended for purposes of clarification and to address the objections to these claims.

Specification.

In compliance with the Examiner's suggestion, the specification was amended, At page 5, line 2, to recite "mA/cm^2" instead of "$\mu A/cm^2$."

Rejections Under 35 U.S.C. § 112, 2nd Paragraph:

Claim 30 was rejected under 35 U.S.C. § 112, 2nd Paragraph, as being indefinite for dot further limiting the claim from which it depended. Appropriate amendment is hereby made.

Rejection Under 35 U.S.C. § 103(a):

Claims 10-14 16-20, and 29-31 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen (WO 99/47731) in view of Landau (6,261,433).

Claim 31 is hereby canceled.

The present invention relates to a method of plating copper directly onto a barrier layer. Each of Chen and Landau relate to plating copper onto a seed layer.

Chen recites a need to provide copper metallization to a barrier layer. "The present inventors have recognized that there exists a need to provide copper metallization processing techniques that 1) provide conformal copper coverage with adequate adhesion to the barrier layer..." (Page 6, lines 9-11). Chen recites electroplating "copper directly onto a barrier layer material." (Page 7, line 4; and see Abstract). However, Chen does not teach a successful method. Chen discloses a "process for enhancing a seed layer." (Page 7, line 17). "The process includes the forming of an ultra-thin metal seed layer on the barrier layer." (Page 8, lines 1-2). Chen recite the advantage of their process as being due to the "inter-copper chemical bond between the PVD copper [seed layer] and the electrochemically deposited copper." (Page 20, lines 9-10).

Claim 10 is hereby amended to recite a stabilizer that may be 2,2'-bipyridyl (see claim 22) and cyanide (recitation from canceled claim 23). Chen and Landau are each silent as to a stabilizer, as to bipyridyl, and as to cyanide.

The Examiner cites Landau at disclosing current densities of from 5 to 40 mA/cm^2. A person of skill in the art would not entertain a reasonable expectation of success by combining Landau with Chen.[1] Landau and Chen are mutually inoperable. Landau discloses a plating solution containing up to 0.2 M sulfuric acid, whereas Chen discloses a plating solution having a pH of 5-13 and preferably at least 9.5.[2] There is no motivation, stated in the cited art, to combine a high-pH solution with a low-pH solution. Therefore, there is no motivation in the cited art to combine the current density, appropriate to electroplating from low-pH solutions, to electroplating from high-pH solutions.[3]

Claims 15, and 21-23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen (WO 99/47731) in view of Landau (6,261,433) and further in view of Ting (5,969,422).

The rejection over Chen and Landau has been traversed above. Ting relates to plating over a seed layer and not directly on a barrier layer. The Examiner cites Ting as teaching barrier layer materials. However, such teachings do not relate to the present invention that teaches electroplating dierectly on a barrier layer without an intervening seed layer.

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[1] The prior art lacks the necessary direction or incentive to those of ordinary skill in the art to render a rejection under 35 U.S.C. § 103 sustainable. The prior art fails to provide the degree of predictability of success of achieving the properties attained by the present invention needed to sustain a rejection under 35 U.S.C. § 103. See *In re Mercier*, 187 USPQ 774 (CCPA, 1975) and *In re Naylor*, 152 USPQ 106 (CCPA, 1966).

[2] Where the Examiner proposes a combination that makes a prior art reference inoperable for its intended purpose, the resulting inoperable prior art reference is considered to teach away from the proposed combination, thereby supporting a showing of nonobviousness. *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984) (Finding no suggestion to modify a prior art device where the modification would make the device inoperable for its intended purpose); *TecAir, Inc. v. Denso Mfg. Michigan Inc.*, 192 F.3d 1353, 52 USPQ 2d 1294, 1298 (Fed. Cir. 1999) (Holding that because the combination was inoperable for its intended purpose, a jury could reasonably find the patent taught away from the combination); *In re Sponnoble*, 405 F.2d 578, 587 (CCPA 1969)(Holding if where combined, the references would produce a seemingly inoperative device, the references teach away from their combination).

[3] Holding of invalidity based on combination of two or more prior art teachings requires showing of some motivation or suggestion to combine those teachings. Robotic Vision Systems Inc. v. View Engineering Inc., 51 USPQ2d 1948 (CAFC 1999) (98-1477). See In re SangSu Lee, 277 F.3d 1338 (Fed. Cir. 2002).

Claims 15, and 21-23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Gilton (5,151,168) and Woo (6,440,289) and further in view of Landau (6,261,433).

Woo relates to a seed layer (see abstract). Moreover, Each of Gilton, Woo, and Landau are silent as to bipyridyl and cyanide. Gilton relates to current densities of less than 1 mA/cm^2. Therefore, Gilton is not combinable with Landau.

In view of the above, consideration and allowance are, therefore, respectfully solicited.

In the event that the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

The Commissioner is hereby authorized to charge any fees or credit any overpayment associated with this communication including any extension fees to Deposit Account No. 22-0185.

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Respectfully submitted,

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